

# Teaching Methods Reform and Curriculum Construction of “Atmospheric Sounding”

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**Abstract**—Through the analysis of the situation and existing problems of “atmospheric sounding”, a series of pertinent teaching research have been carried out, the goal of scientific curriculum construction has been determined, and a reasonable and high-level teaching team has been set up to standardize the teaching infrastructure, serious and difficult problems in the course construction and teaching have been solved, teaching method has been innovated, teaching effect has been improved. Students' autonomous learning model has been constructed to improve students' learning ability. A multidimensional practice teaching system has been established, and practical training has been carried out in many ways to improve students' practical quality. The system of academic evaluation has been reformed and a diversified assessment system has been constructed. The students' ability has been proved, and the graduates have been fully recognized by the employers. The reform of the teaching methods and the construction of “atmospheric sounding” are good. It explores a new curriculum construction model which is consistent with the training target of talents, and constructs a teaching mode which meets the needs of the industry and diversified development of students.

**Keywords**—*Atmospheric sounding; Teaching methods; Curriculum construction*

## I. INTRODUCTION

### A. Reform is to meet the requirements of the talents in the meteorological industry

Atmospheric sounding data obtained is the basis for weather forecasting and climate prediction, no mass detection data support, other work will be impossible. Only graduates with atmospheric sounding technology can be competent for the work of the meteorological department [1].

### B. Reform is the requirement of talents training target for curriculum construction

The major of Atmospheric Science in Guangdong Ocean University is to train the business oriented talents who are facing the needs of the meteorological industry. The study of atmospheric sounding, students' ability of atmospheric detection and data analysis can be trained, and lay a foundation for solving the problem of atmospheric science [2].

### C. New technology puts forward new requirements for curriculum construction

With the rapid development of atmospheric exploration means and equipment and data processing technology, it is urgent to improve the teaching content, experimental conditions, students' independent learning ability and innovative ability. With the rapid development of Internet technology, educational technology, students of different objects, also requires that the curriculum construction and educational innovation, combined with the development of the industry, to further promote the reform of teaching, improving teaching quality and teaching level, cultivate more graduates adapt to the demand of modern meteorological services Meteorological industry [3].

### D. Problems existing in curriculum construction

The following problems still exist. The whole teaching ability is insufficient, and there is no integration of professional teachers. The goal of curriculum is not reasonable, and it can't adapt to the modernization of the meteorological service and the demand for talent training. The updating of teaching content is not timely and lacks the coordinated development with the industry. Theoretical teaching is out of line with practical ability. The teaching approach is narrow and can't meet the needs of students' autonomous learning. The way of evaluation is single, so it is impossible to evaluate students' actual ability and learning effect scientifically [4].

## II. SOLUTIONS TO PROBLEMS EXISTING IN CURRICULUM CONSTRUCTION AND TEACHING

### A. *Based on the training of qualified personnel, the goal of scientific curriculum construction is determined*

According to the students' basic and future career development planning and the needs of atmospheric science, different students should be trained in different ways. For the students who have been employed since graduation, strengthen their practical ability, strengthen training in combination with the actual situation, and cultivate applied talents. For graduates in management positions, equipment, software and comprehensive ability are trained. For graduates who wish to pursue further studies, they should train their research ability should be trained [5].

### B. *Set up a reasonable curriculum teaching team*

With the support of ocean and atmosphere college, there is a rich experience team in atmospheric exploration teaching. The full-time professor graduated from many different research institutes, and all of them are famous universities in atmospheric science, for example, Peking University, Nanjing University, Nanjing University of Information Science and Technology, Chengdu University of Information Science and Technology, etc. Among the full-time teachers, there are three teachers over 50 years old, two teachers aged 36-49, and one teachers under 35 years old, accounting for 50%, 33.3% and 16.7% of the total number of teachers, respectively. The team has 6 full-time teachers, including one professors, two associate professors, senior teachers accounted for 50%.

Encourage and support personnel to achieve their ideality, according to the actual situation of every teacher, every semester leaders urge teachers to actively participate in professional, curriculum construction, teachers' teaching ability training,, make full use of cadres online, teachers online learning center, MOOC class and other learning resources; at the same time, full-time teachers often be sent to other universities for further study and training; there are plans to arrange team members to train or study in the meteorological department; teachers may participate in academic exchange conference.

In addition, two part-time teachers are hired. Employing experienced management and technical personnel as instructors in practical courses, enriched the team of practical teaching.

### C. *Strengthen the construction of teaching and ensure the standard of teaching*

Construction of basic teaching documents. Compile the program of theoretical courses (including experimental teaching), experiment instruction and practice instruction. In the teaching program clearly provides the content of each chapter, teaching methods, specified extracurricular reading materials and after-school questions, announced to the students through the network, to guide students learning, and standardize the teachers teaching [6].

Construction and use of teaching resources. The latest version of "atmospheric sounding science" written by Sun Xuejin and published by the meteorological Publishing Press,

is used for teaching; industry standard "ground meteorological observation standard" is selected as the experimental teaching. According to the contents of the course and the latest progress of the industry, students are required to read relevant documents and communicate regularly. At present, the teaching resources of online include "Atmospheric sounding" teaching program, teaching plan, bibliography, electronic teaching plan, examination questions database and related academic articles. Teachers and students communicate conveniently and in time through the curriculum platform.

### D. *Carrying out teaching research to solve the key and difficult problems in curriculum construction and teaching*

#### 1) *Optimizing the curriculum system of atmospheric science.*

The teaching contents reflect the leading edge of subject development in time, and highlight the characteristics of the times. Strengthen the experimental teaching link, build the platform of practical ability training.

#### 2) *Implementing the reform of teaching methods and improving teaching quality by means of diversified teaching methods.*

According to the characteristics of "atmospheric sounding", the heuristic teaching method is been used, generation process, emotional process, induced by the moving process, open process, inquiry process, process, process, application of construction process and other aspects of the practice from the presupposition and arouses the students "interest in learning" atmosphere detection, enhance the learning actively of the students, cultivate the students' self-learning ability, practical ability and creative spirit. The practice of generation process, emotional process, doubt process, inquiry process, and application process, has greatly stimulated students' interest in "atmospheric sounding".

Use the curriculum website to build a platform for students to study independently. Such as an attempt to "explore the flipped classroom teaching", students' learning will change from "want me to learn "to" I want to learn ", the students' communication ability, cooperation consciousness and practical ability has been greatly improved.

Pay attention to the course paper, students' innovation and entrepreneurship training, graduation thesis, and cultivate the students' spirit of scientific research. After teaching each chapter, the teacher designated reading academic documents to guide students to read and report. Guide students to carry out scientific research methods training, encourage students to actively declare the college students' innovative training project, or join the teacher's research projects. University and college record Innovative Practice Credits for papers published and related research activities, which can act as optional courses. Combining the graduation thesis with the course study, the teacher can draw up the title of the subject according to the requirement, which is selected by the students according to their interest and approved by the college. Teachers guide students to consult documents, write reading reports, guide students to observe, process data, and write papers. Due to the accurate selection of the topic, the teacher guides seriously, and guides the students to have a higher level of graduation thesis.

The reform of teaching methods and means arouses the enthusiasm of teachers, improves the students' interest in learning, and makes the students' initiative and creativity be excavated

### 3) Construction of practice teaching system of "Atmospheric Sounding" combined with production, teach and research.

Under the background of rapid development of modern meteorological services, the atmosphere exploration service in the new period has new requirements for post capacity. In order to maintain the smooth connection between atmospheric science graduates and modern meteorological observation services, the teaching team adheres to the road of "combination of production, teaching and research". According to the actual practice teaching of "atmospheric sounding", carry out all-round, multi-level cooperation with the meteorological department, establishing mutual benefit and long-term stable cooperative relations. In accordance with the step-by-step principle, arranging the practice teaching progress at different levels and stages. It effectively promotes the improvement of students' atmospheric sounding technology, helps students realize the adaptation from school to job, and realizes the goal of finished product talents training.

Simulated meteorological observation station to carry out "implantable" practice. Make full use of atmospheric detection laboratory, organizing and guiding the students in their spare time, the implementation of extra-curricular learning, continuous observation practice for three years. Through the training of practice ability in workshops, the exercise of students' practical ability can be transferred from simple simulation and imitation to the actual stage of approaching station service.

### 4) Practice base of Atmospheric Science Teaching Construction -- "Zhanjiang Meteorological Bureau base".

Through the establishment of the project base of Students' extracurricular practice, a long-term mechanism for coordinated training with the industry has been established. Technical personnel who involved in the construction of courses, guide students to practice / graduation thesis of graduation practice / practice base construction conditions, improve the quality of teaching practice of students. Zhanjiang Meteorological Bureau with ground meteorological observation, marine meteorological monitoring, a new generation of weather radar observations, disaster weather warning, lightning monitoring and protection, and full range of the atmospheric detection business projects, fully meet the atmospheric sounding course practice teaching needs.

### 5) Research on curriculum examination reform program.

Related research results won the 2008 teaching achievement award. In order to arouse students' enthusiasm for study and promote students' initiative learning, and satisfy the

requirements of the meteorological department for front-line staff, the curriculum team has carried out research and reform on the evaluation of students' academic achievement. The usual study state, curriculum, academic papers, reports, extracurricular observation are included in the scope of academic evaluation. Improving students' comprehensive quality through guiding process evaluation.

## III. CURRICULUM CONSTRUCTION AND INNOVATION OF TEACHING REFORM

### A. Theoretical innovation

Innovating the curriculum model which is consistent with the goal of talent training. Based on the goal of curriculum reform, years of series course construction project supporting method of diversified talent classification training. Construction of training curriculum model is a new way for atmospheric science talent training.

The curriculum goal of adapting to the needs of the industry and diversified development of the students is defined scientifically. Establishing long-term mechanism of collaborative training course, seamless industry needs. According to the students' development goals, set up teaching methods of classification of teaching objectives [7].

### B. Practice innovation

Innovative teaching methods to improve the effect of classroom teaching. Since the course construction, teaching method has been constantly innovating, the heuristic teaching method and inquiry learning method have been introduced into the traditional classroom. The rich forms make classroom teaching lively and orderly, and improve the students' participation and initiative in class.

Innovating students' autonomous learning model to improve students' learning ability. Combined with classroom teaching, through many years' efforts, abundant teaching resources have been set up. Students can make use of teaching resources package to carry out theoretical knowledge development and the test of learning effect, which will help students to study autonomously and develop their learning ability [8].

Innovating practice teaching, multi-channel practice, enhance students' practical quality. Constructing multidimensional practice teaching system.

Innovative academic evaluation methods to build a diversified assessment system. Pay attention to the ability and process assessment, build an integrated assessment mechanism, which enhance the effectiveness of the examination, and improve the learning effect of students.

#### IV. ACHIEVEMENTS HAVE BEEN MADE IN CURRICULUM CONSTRUCTION AND TEACHING REFORM

The students' ability has been confirmed and the graduates have been fully recognized by the employers.

Theory teaching and practice training of "atmospheric sounding", enhance students' understanding of atmospheric science, stimulate enthusiasm for learning, develop a habit in the spare time of observation, and take the initiative to take group discussion. The accumulation of empirical observations, deepen the understanding on the job. Students' employment competitiveness enhanced, in the meteorological staff recruitment, graduates are among the best [9].

The students take the initiative to enter the laboratory, under the guidance of the teacher, have approved 11 projects, 70 students attended, 8 papers had published. Since 2010, about 50 students have been enrolled in high-level universities and research institutes.

More than 70% of graduates enter the Meteorological Bureau and air traffic control station at various levels, and obtain outstanding achievements in their posts. Graduate named Pang Yongyan, was awarded the title of "excellent meteorological observer" by the China Meteorological Administration in 2009, Graduate named Li Huiqing, was awarded the title of "excellent meteorological observer" by the China Meteorological Administration in 2013, and so on [10].

#### V. CONCLUSION

Shortage of curriculum construction and teaching reform. The development of atmospheric exploration is fast, and the teaching content needs to be updated and supplemented to meet the teaching needs.

Prospects of curriculum construction. To further enrich "atmospheric sounding" teaching resources. Curriculum will be comprehensively combed, knowledge points will be broken down, teaching will be designed. Recording MOOC, create conditions for students to study independently, research learning and cooperative study.

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